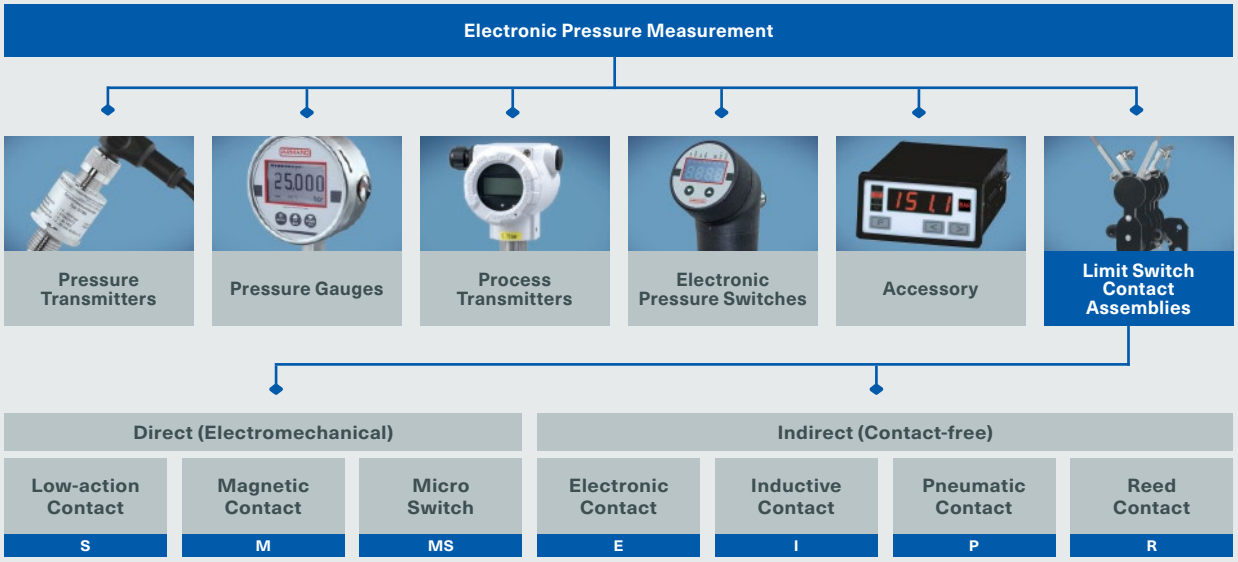
Heading 9.1

ARMANO

Limit Switch Contact Assemblies

Pressure and temperature measurement

ARMANO Messtechnik GmbH



Quality Made in Germany

Limit Switch Contact Assemblies

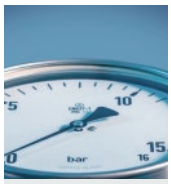
The ARMANO Messtechnik GmbH represents tradition and innovation in the production and distribution of precision pressure and temperature measuring instruments, which have an excellent reputation worldwide – for more than 100 years.

We are continually developing customer-specific solutions for a variety of applications requiring pressure and temperature measuring technology. Their use is manifold and there are always new applications.

Limit switch contact assemblies for pressure gauges and thermometers close or open electric or pneumatic circuits. In addition, we also offer corresponding accessories, e.g. relays or switch amplifiers.

This brochure contains general and detailed definitions, applications and operating principles for the respective limit switch types. It also provides detailed information on the selection, switching functions and minimum spans, on operating conditions, explosion protection, technical data, options and others. Further information can be found in DIN 16085 (pressure gauges) or DIN 16196 (thermometers).

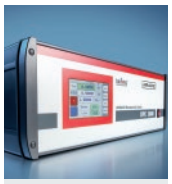
Our Products at a Glance



Mechanical Pressure Measurement

Electronic Pressure Measurement

Chemical Seal Mounting



Calibration Technology

Mechanical Temperature Measurement

Electrical Temperature Measurement

Thermowells & Accessories

Application and Operating Principles

Limit switch contact assemblies for pressure measuring instruments close or open electric or pneumatic circuits on a pressure-dependent basis. Pressure measuring instruments with limit switches are suitable for the measurement of absolute pressures, differential pressures as well as positive and negative gauge pressures of liquid or gaseous media. However, also gas-actuated thermometers are available with limit switch contact assembly.

By pushing and simultaneously turning the adjusting key ❶ into the adjusting lock ❸, the limit setting pointers ❷ can be set over the entire range of the dial.

The design of limit switch contact assemblies allows the continued operation of the **actual value pointer** beyond the **limit setting pointer**, after the limit signal has been transmitted. The limit setting pointers can be set over the entire range of the scale. Please consider the information and recommendations under “Setting Ranges of the Contacts”.

With a **removable key**, the limit setting pointer is externally set to the value at which the switching operation is to take place. For limit switches with NCS 63 and reed contact, the adjustment is usually done manually after removing the bayonet ring. For limit switches with 1 and 2 contacts, the specifications of DIN 16085 (for pressure gauges) and DIN 16196 (for thermometers) apply.

In addition, also limit switches with 3 or 4 contacts are available. Here, particular specifications regarding adjustment ranges, switching hysteresis and adjustment of the pointers one above the other are required.

For information on this and on the available limit switch contact assemblies etc., please refer to the data sheets with the last digits .90 or please contact us.

Terminology

Contact load
Permissible maximum values of the electrical load of a contact.

Switching pressure
The pressure of the medium at the time the switching function is activated.
(Source: DIN 16085)

Switching point
The scale value at which the switching function is activated.

Switching direction
(direction of action of the switching function)
Characterised by the movement of the actual value pointer at which the switching process takes place:
- clockwise switching direction with rising pressure
- counterclockwise switching direction with falling pressure

Switching function
We have defined three switching functions:

Making contact (code number 1)
When the set limit value is exceeded during clockwise pointer movement, the connected circuit is closed.

Breaking contact (code number 2)
When the set limit value is exceeded during clockwise pointer movement, the connected circuit is opened.

Change-over contact (code number 3)
When the set limit value is exceeded, one circuit is opened and one circuit is closed simultaneously (or one directly after the other).

See “Switching Functions” on page 6

Switching accuracy
(accuracy of the switching operation)
Indicates the deviation of the switching pressure from the set limit value in the specified switching direction. According to DIN 16085, it must not exceed 1.5 times the error limit of the pressure measuring instrument.

Switching difference
The difference between the switching points of two limit values. The minimum distance between two switching points is the minimum possible switching difference.

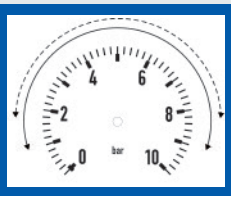
Switching hysteresis
The difference of the switching pressures at the time the switching function of one contact is activated with rising and falling pressure but unchanged reference value of the switching pressure.
(Source: DIN 16085)

General Features

Selection Information

Setting Ranges of the Contacts

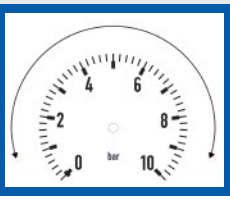
The standards DIN 16085 (pressure gauges) and DIN 16196 (thermometers) apply in conjunction with the instrument standards DIN EN 831-1/-3 (pressure gauges) and DIN EN 13190 (thermometers) respectively. As additional forces act on pressure gauges / thermometers with limit switch contact assemblies, we have defined the range in which the limit switches shall work optimally and which is set ex works, based on the standards as follows:



Limit switches with 1 contact

S low-action contact
E electronic contact
I inductive contact
P pneumatic contact 10 – 90 % (——)

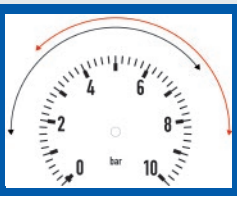
M magnetic contact 15 – 85 % (----)



Limit switches with 2 contacts

S low-action contacts
E electronic contacts
I inductive contacts
P pneumatic contacts

both contacts 10 – 90 %



Limit switches with 2 contacts

M magnetic contacts

1st contact 15 – 70 % (——)
2nd contact 30 – 85 % (——)

Beyond these specified ranges, among other things, higher switching inaccuracies and larger or smaller switching hystereses may occur. This problem especially occurs with magnetic contacts, because when, for example, decreasing the magnetic forces during adjustment, the specified maximum contact load can no longer be fully utilised. With magnetic contacts, it is generally not possible to combine a maximum contact load with minimum snap action (low magnetic force).

Switching Difference

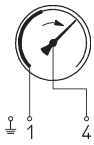
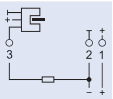
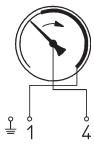
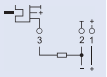
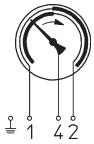
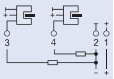
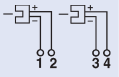
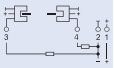
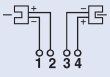
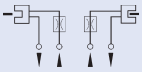
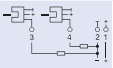
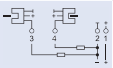
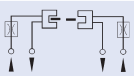
The switching difference between two switching points must be larger than the switching hysteresis and, for magnetic contacts, it also must be larger than the snap action to ensure that the switching points can be reliably distinguished.

Limit switch	Switching function	Switching difference
S low-action contact **E** electronic contact	11, 22	> switching hysteresis
I inductive contact **P** pneumatic contact	12, 21	≥ 2 % of the span
M magnetic contact	11, 22	≥ 6 % of the span
	12, 21	≥ 12 % of the span

Special Solutions

If your operating conditions are beyond those limits, please contact us and we will work out a solution individually adapted to your conditions.

Switching Functions

1 contact	Low-action / magnetic S, M			Electronic E		Inductive I		Pneumatic P		Reed R		Micro switch MS
breaking contact		S2	M2		E2		I2		P2		R2	–
making contact		S1	M1		E1		I1		P1		R1	–
Single change-over	**Low-action / magnetic S, M**											**Micro switch MS**
		S3	M3									
2 contacts[1)]	**Low-action / magnetic S, M**			**Electronic E**		**Inductive I**		**Pneumatic P**		**Reed R**		**Micro switch MS**
1st and 2nd breaking contact		S22	M22		E22		I22		see below[2)]		R22	–
1st breaking contact 2nd making contact		S21	M21		E21		I21		P21		R21	–
1st and 2nd making contact		S11	M11		E11		I11		see below[3)]		R11	–
1st making contact 2nd breaking contact		S12	M12		E12		I12		P12		R12	–

ws = white
bn = brown
gb = yellow
gn = green

[1)] order of the contacts clockwise
[2)] available by replugging the hose bridges of P21
[3)] available by replugging the hose bridges of P12

Minimum Spans

Please regard the minimum spans! Each pressure gauge / thermometer needs certain directive forces of the measuring element for operating a limit switch contact assembly. Therefore, the installation is possible from the minimum measuring ranges indicated in the table.

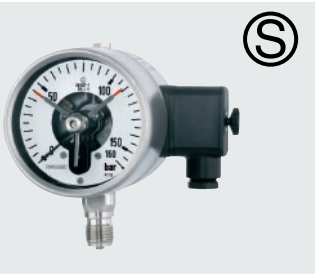
Limit switch	Measuring instrument		Unit	Number of contacts			
				1	2	3	4
S low-action contact	Bourdon tube pressure gauges	NCS 63	bar	upon request	upon request	—	—
		NCS 100, 96x96	bar	1.0	1.6	2.5	upon request
		NCS 160, 144x144	bar	1.0	1.6	2.5	2.5
	differential pressure gauges[1)]	DiRZ...160	bar	1.0	1.6	upon request	—
	diaphragm pressure gauges	NCS 100, flange Ø 160	mbar	60	100	160	160
		NCS 100, flange Ø 100	bar	0.6	0.6	0.6	0.6
		NCS 160, flange Ø 160	mbar	60	100	160	160
		NCS 160, flange Ø 100	bar	0.6	0.6	0.6	0.6
	thermometers	NCS 100, 160	°C	no minimum span for standard pressure ranges			
M magnetic contact	Bourdon tube pressure gauges	NCS 63	bar	2.5	4.0	—	—
		NCS 100, 96x96	bar	1.6	2.5	4	—
		NCS 160, 144x144	bar	1.6	2.5	4	4
	differential pressure gauges[1)]	DiRZ...160	bar	1.6	4.0	upon request	—
	diaphragm pressure gauges	NCS 100, flange Ø 160	mbar	100	160	250 + 400	upon request
		NCS 100, flange Ø 100	bar	0.6	0.6	2.5	upon request
		NCS 160, flange Ø 160	mbar	100	160	250 + 400	250 + 400
		NCS 160, flange Ø 100	bar	0.6	0.6	2.5	2.5
	thermometers	NCS 100, 160	°C	no minimum span for standard pressure ranges			
E electronic contact	Bourdon tube pressure gauges	NCS 63	bar	2.5	4.0	—	—
		NCS 100, 96x96	bar	1.0	1.6	2.5	upon request
		NCS 160, 144x144	bar	1.0	1.6	2.5	upon request
	differential pressure gauges[1)]	DiRZ...160	bar	1.0	1.6	upon request	—
	diaphragm pressure gauges	flange Ø 160	mbar	60	60	60	upon request
		flange Ø 100	bar	0.6	0.6	0.6	upon request
	thermometers	NCS 100, 160	°C	no minimum span for standard pressure ranges			
I inductive contact	Bourdon tube pressure gauges	NCS 63	bar	2.5	4.0	—	—
		NCS 100, 96x96	bar	1.0	1.6	2.5	upon request
		NCS 160, 144x144	bar	1.0	1.6	2.5	upon request
	differential pressure gauges[1)]	DiRZ...160	bar	1.0	1.6	upon request	—
	diaphragm pressure gauges	flange Ø 160	mbar	60	60	60	upon request
		flange Ø 100	bar	0.6	0.6	0.6	upon request
	thermometers	NCS 100, 160	°C	no minimum span for standard pressure ranges			
P pneumatic contact	Bourdon tube pressure gauges	NCS 100, 96x96	bar	1.0	—	—	—
		NCS 160, 144x144	bar	1.0	1.6	—	—
	diaphragm pressure gauges	NCS 100, flange Ø 160	mbar	60	—	—	—
		NCS 100, flange Ø 100	bar	0.6	—	—	—
		NCS 160, flange Ø 160	mbar	60	60	—	—
		NCS 160, flange Ø 100	bar	0.6	0.6	—	—
R reed contact	Bourdon tube pressure gauges	RSCh 63, RCha 63	bar	2.5	2.5	—	—
MS micro switch	Bourdon tube pressure gauges	NCS 100	bar	2.5	upon request	—	—

[1)] differential pressure gauges with diaphragm upon request

Installation Options for Limit Switch Contact Assemblies

Bourdon Tube Pressure Gauge RCh / RChOe		
Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact micro switch	S M E I P MS
Data sheet	1201.90	

Bourdon Tube Pressure Gauge RQS		
Nominal size	96x96, 144x144 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact	S M E I P
Data sheet	1500.90	

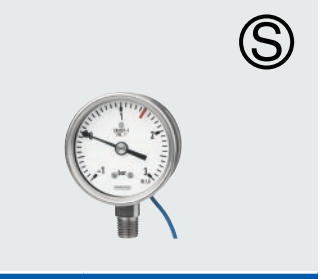


Bourdon Tube Pressure Gauge RSCh / RSChOe		
Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact	S M E I P
Data sheet	1600.90	

Bourdon Tube Pressure Gauge RCh 63		
Nominal size	63 mm	
Additional electrical accessory type	reed contact	R
Data sheet	1211.94	

Bourdon Tube Pressure Gauge RSCh 63		
Nominal size	63 mm	
Additional electrical accessory type	magnetic contact	M
Data sheet	1610.91	

Bourdon Tube Pressure Gauge RSCh 63		
Nominal size	63 mm	
Additional electrical accessory type	electronic contact inductive contact	E I
Data sheet	1610.92	



Bourdon Tube Pressure Gauge RSCh 63		
Nominal size	63 mm	
Additional electrical accessory type	reed contact	R
Data sheet	1610.94	

Diaphragm Pressure Gauge PCh / PChOe

Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact	S M E I P
Data sheet	3201.90	

Diaphragm Pressure Gauge PSCh / PSChOe

Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact	S M E I
Data sheet	3600.90	

Differential Pressure Gauge DiRZCh / DiRZChOe 160

Nominal size	160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact	S M E I
Data sheet	5111.90	

Thermometer TSCh / TSChOe

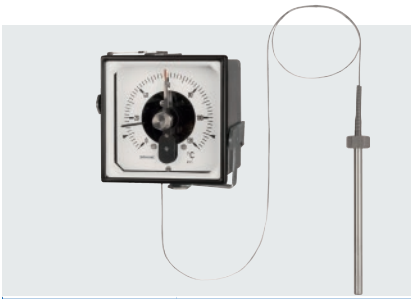
Nominal size	100, 160 mm	
Additional electrical accessory type	magnetic contact electronic contact inductive contact	M E I
Data sheet	8201.90	

Thermometer TGelCh

Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact	S M E I P
Data sheet	8211.90	

Thermometer TFCh / TFChOe

Nominal size	100, 160 mm	
Additional electrical accessory type	magnetic contact electronic contact inductive contact	M E I
Data sheet	8221.90	



Thermometer TFQS

Nominal size	96x96, 144x144 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact pneumatic contact	S M E I P
Data sheet	8225.90	

Thermometer TRCh

Nominal size	100, 160 mm	
Additional electrical accessory type	low-action contact magnetic contact electronic contact inductive contact	S M E I
Data sheet	8293.90	

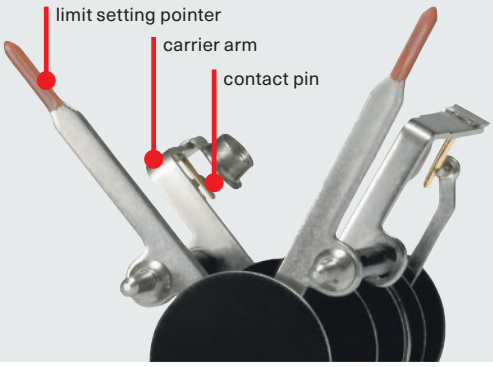
Low-action Contact

For limit switches with low-action contacts, the mechanism for limit signal transmission consists of the adjustable limit setting pointer connected to the carrier arm that holds one contact pin, and the contact arm moved by the actual value pointer, that holds the second contact pin. The switching operation takes place when the actual value pointer and the limit setting pointer are on top of each other. The contact pins are touching each other or are separating. The torque acting on the actual value pointer is low, so that the contacts switch exactly at the adjusted reference value.

Application / Operating Conditions

Low-action contacts are suitable if:

- the device is protected from vibrations and no pulsations occur, as otherwise unintentional switchings may take place.
- the contact pins do not contaminate or oxidise, e.g. due to aggressive atmosphere.



Instruments with low-action contacts generally bear the CE mark for electromagnetic compatibility and the low-voltage directive.

Technical Data

Case filling		without
Electrical	rated insulation voltage	250 V
	rated operational voltage	230 V AC (mains)
	rated operational current	max. 0.6 A
	making / breaking current	max. 0.7 A
	breaking capacity	10 W / 18 VA
Measurement technology	switching hysteresis	≤ accuracy class
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	–20 °C to +70 °C
Contact material		silver-nickel, 10 µ gold-plated (AG80NI20Au10 µ)

Recommended contact load for instruments without case filling at ohmic and inductive load

voltage acc. to DIN IEC 60038				
DC	AC	DC	AC	cosϕ > 0.7
220 V	230 V	40 mA	45 mA	25 mA
110 V	110 V	80 mA	90 mA	45 mA
48 V	48 V	120 mA	170 mA	70 mA
24 V[1)]	24 V	200 mA	350 mA	100 mA

Minimum values for contact load for instruments without case filling at ohmic load

rated operational voltage $U_{eff\ min.}$	24 V
breaking capacity (DC, AC)	0.4 W

Case

Installation in NCS 63, 100, 160, 96 x 96, 144 x 144 mm

Case filling can only be mounted in instruments **without** case filling

Options

- More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There, you will also find information on the adjustment of the limit setting pointers one above the other.
- Separated circuits
- Double change-over contact S33
- Wire break control (resistor connected in parallel for each contact)

Accessory (Page 19)

Pulse controlled multifunctional relay MSR

[1)] at 24 V DC, the switching current must not be less than 20 mA

Magnetic Contact

Compared to limit switches with low-action contacts, limit switches with magnetic contact have an additional screwable permanent magnet attached to the carrier arm of the limit setting pointer, which is secured with locking varnish. This permanent magnet increases the contact pressure and protects the contacts from burns due to electric arcs. The contact making is accelerated sharply when the contacts are approaching and actuated with a delay when the contacts are separating. This skipping behaviour can be 2 to 5 % of the span, depending on the directive forces of the measuring element and the set magnetic force.

Technical Data

Case filling		without	with
Electrical	rated insulation voltage	250 V	
	rated operational voltage	230 V AC (mains)	
	rated operational current	max. 0.6 A	max. 90 mA
	making / breaking current	max. 1.0 A	
	breaking capacity	30 W / 50 VA	20 W / 20 VA
Measurement technology	switching hysteresis	accuracy class + 2 – 5 %	
	switching accuracy	≤ 1.5x accuracy class	
	ambient temperature	–20 °C to +70 °C	
Contact material		silver-nickel, 10 µ gold-plated (AG80NI20Au10 µ)	

Recommended contact load for instruments without case filling at ohmic and inductive load

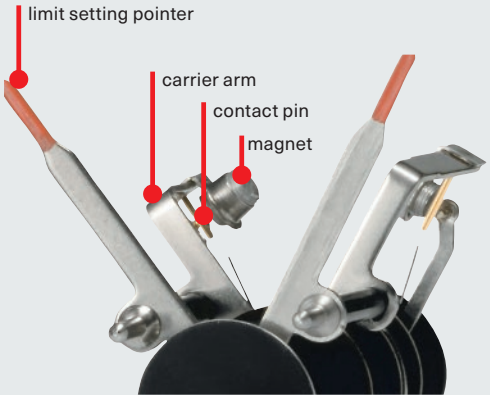
voltage acc. to DIN IEC 60038				
DC	AC	DC	AC	cosφ > 0.7
220 V	230 V	100 mA	120 mA	65 mA
110 V	110 V	200 mA	240 mA	130 mA
48 V	48 V	300 mA	450 mA	200 mA
24 V[1)]	24 V	400 mA	600 mA	250 mA

Minimum values for contact load for instruments without case filling at ohmic load

rated operational voltage $U_{eff\ min.}$	24 V
breaking capacity (DC, AC)	0.4 W

Application / Operating Conditions

- Magnetic contacts can be applied almost anywhere since they are resistant to shocks to a large extent.
- Breaking capacity, switching safety and contact load are considerably higher than those of low-action contacts.



Case

Installation in NCS 63, 100, 160, 96 x 96, 144 x 144 mm

Case filling using a contact protection relay of the MSR series, suitable for devices with case filling to a limited extent

Instruments with magnetic contacts generally bear the CE mark for electromagnetic compatibility and the low-voltage directive.

Options

- More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There, you will also find information on the adjustment of the limit setting pointers one above the other.
- Separated circuits
- Double change-over contact M33
- Wire break control (resistor connected in parallel for each contact)

Accessory (Page 19)

Pulse controlled multifunctional relay MSR

[1)] at 24 V DC, the switching current must not be less than 20 mA

Electronic Contact

For limit switches with electronic contacts, the mechanism for limit signal transmission consists of a slot-type initiator with integrated switching amplifiers (PNP output) and a control lug. The slot-type initiator is mounted on a carrier arm that is connected with the limit setting pointer, the control lug is moved by the actual value pointer. Contact makes when the control lug enters the slot-type initiator. Contact breaks when the control lug leaves the slot-type initiator. The switching operation takes place when the control lug is in the middle of the slot-type initiator. The torque acting on the actual value pointer with the control lug is low, so that the switching operation take place exactly at the set reference value.

Application / Operating Conditions

- Electronic contacts are suitable for every industrial application.
- They are more resistant to unintentional switchings due to shocks / pulsation than low-action contacts.
- They are wear-resistant (contact-free switching) and corrosion-free (all electrical components are moulded waterproof in cast resin in a plastic housing).
- Since the slot-type initiator is a 3-wire slot-type initiator with PNP switching output, a PLC, optocouplers or other electronic evaluation units with low voltages and currents can be actuated directly.

Technical Data

Electrical	rated operational voltage	10...30 V DC
	breaking capacity	≤ 100 mA
Measurement technology	switching hysteresis	≤ accuracy class
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	–25 °C to +70 °C

Instruments with electronic contacts generally bear the CE mark for electromagnetic compatibility.

Case

Installation in NCS	63, 100, 160, 96 x 96, 144 x 144 mm
Case filling	suitable for instruments **with** case filling

Options

- More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There, you will also find information on the adjustment of the limit setting pointers one above the other.
- PNP switching output as 2-wire connection

Inductive Contact

For limit switches with inductive contacts, the mechanism for limit signal transmission consists of a slot-type initiator (displacement transducer according to DIN EN 60947-5-6 (NAMUR)), a control lug and a relay in the downstreamed switch amplifier (application in explosion-hazardous areas) or a multifunctional relay type series MSR-I (application in non-hazardous areas). Switch amplifiers and multifunctional relays are not included in the scope of delivery of a device with inductive contacts. The displacement transducer is mounted on a carrier arm that is connected with the limit setting pointer, the control lug is moved by the actual value pointer. The slot-type initiator is basically a transistor oscillator with oscillator coils on both sides of the slot-type initiator. When the control lug enters the slot-type initiator, the latter has high impedance (small control current ≤ 1 mA), the relay in the downstreamed switch amplifier is de-energised and contact breaks. When the control lug leaves the slot-type initiator, the latter has low impedance (large control current ≥ 3 mA), the relay is energised and contact makes. The torque acting on the actual value pointer with the control lug is low, so that the switching operation take place exactly at the set reference value.

Technical Data

Electrical	rated operational voltage	5...25 V DC
	rated voltage	8 V AC
	current consumption	max. 3 mA
Measurement technology	switching hysteresis	≤ accuracy class
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	−20 °C to +70 °C
	SN / S1N version (see options)	−40 °C to +100 °C

Application / Operating Conditions

- In connection with our multifunctional relays type series MSR-I, inductive contacts are suitable for every industrial application.
- They are wear-resistant (contact-free switching) and corrosion-free (all electrical components are moulded waterproof in cast resin in a plastic housing).
- According to IEC 61508, slot-type initiators are applicable up to SIL 2.

Accessory (Page 18)

- Pulse controlled multifunctional relay MSR-I
- Switch amplifier KFU8-SR-...W

Case

Installation in NCS 63, 100, 160, 96 x 96, 144 x 144 mm

Case filling suitable for instruments **with** case filling

Instruments with inductive contacts generally bear the CE mark for the ATEX directive.

Options

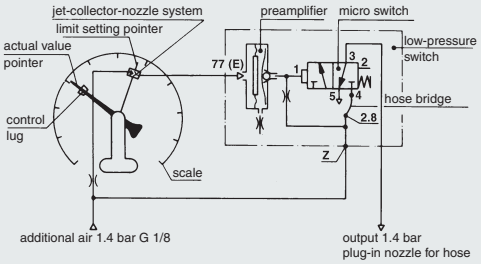
- More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There, you will also find information on the adjustment of the limit setting pointers one above the other.
- Safety version (SN) in connection with switch amplifier devices in safety technology (see technical information sheet T09-000-041) applicable for the building of self-monitoring controls (safety switching). If a failure occurs, whether at the slot-type initiator or in the switch amplifier, the initial state inevitably becomes “0”. The design of these safety switches was tested and approved by the TÜV (German Technical Inspection Association) according to safety-related requirements for important switchings. The electrical characteristic values correspond to DIN EN 60947-5-6 (NAMUR).
- Safety version with reversed direction of action (S1N) (NCS 160 only).

Pneumatic Contact

For limit switches with pneumatic contacts, the mechanism for limit signal transmission consists of a jet-collector-nozzle system, a control lug and a pneumatic low-pressure switch (PP converter). The jet-collector-nozzle system is mounted on a carrier arm that is connected with the limit setting pointer, while the control lug is moved by the actual value pointer. In this system, a reduced permanent air flow is directed from the jet nozzle to the collector nozzle. The low-pressure signal (> 25 mbar), received by the collector nozzle, is directed to the preamplifier of the low-pressure switch. This causes the micro switch to connect the hose connections and thus generates a 1.4 bar output signal at the output. When the actual value pointer reaches the limit setting pointer, the control lug, moved by the actual value pointer, interrupts the air flow in the jet-collector-nozzle system. The switching is activated by the absence of the low-pressure signal at the preamplifier. The micro switch returns to its initial position and vents the connection.

Application / Operating Conditions

Pneumatic contacts are characterised by a high switching accuracy and are relatively shock-resistant.



Instruments with pneumatic contacts are not subject to the requirement for CE marking.

Technical Data

Air consumption		< 30 l/h PP converter: < 40 Nl/h at 1.4 bar
Operating air pressure		$1.4^{\pm 0.1}$ bar
Purity specification for control air		≤ 0.04 mm
Mechanical durability		PP converter: approx. 10^8 switching cycles
Measurement technology	switching hysteresis	≤ accuracy class
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	–20 °C to +70 °C

Case

Installation in NCS	100, 160, 96 x 96, 144 x 144 mm
Case filling	not suitable for liquid-filled devices (air flow)

Options

- More than 2 contacts are not available.
- Instead of the pneumatic low-pressure switch (PP converter), a pneumatic / electrical converter (PE converter) can also be used. This is recommended when linking pneumatic and electrical devices and when monitoring signals over longer distances to avoid delays.
- The switching functions P11 / P22 can be reversed by replugging the hose bridges.

EX Protection

Limit switches with pneumatic contacts do not contain any potential ignition sources and are suitable for use in zone 1 (with appropriate protective measures also in zone 0).

Reed Contact

The reed contact is a fast bistable special switch that can be applied for switching low-level signals in the mV and µA range. It consists of two ferromagnetic contact studs, which are hermetically sealed in a glass tube under an inert atmosphere and are mounted rotatably on a conductor plate behind the dial. When a sufficiently strong magnetic field approaches the actual value pointer, both contact studs attain reverse magnetic polarity and thus activate the contact. A permanent magnet behind the glass tube ensures that the switching function is maintained when the actual value pointer continues to move. The reference values are set manually after removing the bayonet ring; for the case configurations “Fr” and “rFr” externally via removable key.

Technical Data

Breaking capacity		10 W / 10 VA
Max. switching voltage		75 V DC, 50 V AC
Max. switching current		0.5 A with DC or AC voltage and pure ohmic load
Adjustment range		10 % to 90 % of the full scale value
Mechanical durability		approx. 10^5 – 10^8 switching cycles
Measurement technology	switching hysteresis	max. 2.5 % of the span
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	–30 °C to +75 °C
Contact material		Ruthenium Ru

Application / Operating Conditions

Reed contacts have the following advantages over electro-mechanical contacts (S, M):

- Contact-free switching with reliable contact making
- Small dimensions

Case

Installation in NCS 63 mm

Case filling can only be mounted in instruments **without** case filling

Instruments with reed contacts generally bear the CE mark for electromagnetic compatibility.

Options

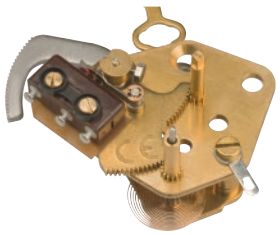
- More than 2 contacts are not available.
- Single change-over contact R3

EX Protection

Available when using intrinsically safe switch amplifiers, as this is passive electrical equipment without storage behaviour. No marking according to ATEX; however, a Declaration of Manufacturer is available.

Micro Switch

The micro switch is a snap-action switch in which a spring element actuates the contacts sharply. It is attached to the movement. Micro switches are generally designed as single-pole change-over contacts. They close or open electrical circuits depending on the direction of movement at the set limit values.



Application / Operating Conditions

- Micro switches are particularly suitable wherever a high breaking capacity is required.
- They are also characterised by their vibration resistance and their long durability.
- Due to the required minimum actuating forces, movements with attached micro switches are suitable for low measuring ranges to a limited extent only, and have a lower switching accuracy.

Instruments with micro switch generally bear the CE mark for electromagnetic compatibility and the low-voltage directive.

Technical Data

Rated operational voltage		250 V DC
Switching current		max. 5 A (ohmic load) max. 5 A (inductive load, cosφ > 0.75)
Measurement technology	switching hysteresis	≤ accuracy class + 2 – 5 % of the span
	switching accuracy	≤ 1.5x accuracy class
	ambient temperature	–20 °C to +70 °C

Case

Installation in NCS 100 mm

Case filling can only be mounted in instruments **without** case filling due to the externally accessible adjusting mechanism

Options

- 2 contacts upon request

Special Gauges with Limit Switch Contact Assembly

SF_6 Gas Density Monitor

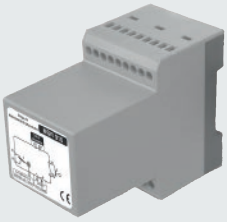
RChg / RChgOe / RChgN 100 – 3 SF6	
Case / ring	crimped-on ring case stainless steel
Case filling	RChg – without RChgOe – special oil RChgN – nitrogen
Accuracy	class 1.0 at +20 °C (NCS 100) class 2.5 at –20 / +60 °C
Nominal size	100 mm
Wetted parts	– 3 stainless steel 316L gas-shielded arc welding, leakage rate < 10^{-9} mbar l/s
Pressure ranges	e.g. –0.1 / +0.9 MPa
Data sheet	1902

SF_6 Gas Density Monitor

RChgN 63 – 3 SF6	
Case / ring	crimped-on ring case stainless steel
Case filling	RChgN – nitrogen
Accuracy	class 1.0 at +20 °C class 2.5 at –20 / +60 °C
Nominal size	63 mm
Wetted parts	– 3 stainless steel 316L gas-shielded arc welding, leakage rate < 10^{-9} mbar l/s
Pressure ranges	spans 2.5 to 16 bar gauge or absolute pressure
Industry brochure SF6	

A gas density monitor is a density indicator, which is extended by electrical limit switches with magnetic contacts. The bimetal compensation is dimensioned to a reference isochore of the SF_6 gas, the so-called calibration pressure p_c, which in this application typically corresponds to the first switching point in falling direction. Calibration pressure, switching point adjustment and scale according to customer specification.

Accessory for Limit Switch Contact Assemblies

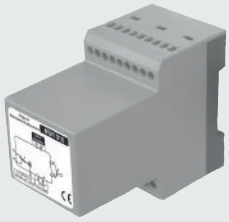


Pulse Controlled Multifunctional Relay

MSR

Additional electrical accessory type	low-action contact magnetic contact	S M
Data sheet	9521	

- Should be used for devices with case filling. They reduce the risk of oil contamination caused by the electric arc (mandatory for silicone-free version if contacts are loaded with 20 V / 20 VA).
- Increase the switching safety and allow a higher switching frequency, which is affected by external influences such as aggressive atmospheres, contamination or oxidation of the contact pins.
- Decrease the contact load.
- Reduce unintentional switchings due to shock / vibration by an integrated release delay of 450 ms.



Pulse Controlled Multifunctional Relay

MSR-I

Additional electrical accessory type	inductive contact	I
Data sheet	9531	

- Are applied in systems where no explosion protection is required.
- Reduce unintentional switchings due to shock / vibration by an integrated release delay of 450 ms.

Switch Amplifier

KFU8-SR-...W

Additional electrical accessory type	inductive contact	I
Data sheet	9533	

- Correspond to ignition protection type intrinsic safety i, are classified for gas and dust Ex zones and are approved for use in explosion-hazardous areas. Marking according to data sheet.
- Have to be installed outside the (explosion-)hazardous area.
- EU Type Examination Certificates on the intrinsic safety of the used slot-type initiators and switch amplifiers are available.

Certificates and Approvals

Our company is certified according to the highest quality standards and our product portfolio meets the highest quality demands. We do not only manufacture according to product-specific instrument standards, we also offer versions with special approvals for application areas with specific requirements. The ARMANO Messtechnik GmbH is certified according to DIN EN ISO 9001.

Ordering Information

For an optimal function of the devices with limit switch, please specify in your order text:

- correct specification of the switching function
- switching pressures
- switching ranges, which are beyond the adjustment ranges defined by us
- if you require a counterclockwise switching direction.

Detailed information on the order text can be found in the data sheets of the respective instrument models with the last digits .90.

We are pleased to offer our help and answer any of your questions and provide background information on our limit switch contact assemblies. We can only optimise the measuring instrument for your specific case of application when receiving exact, complete information on the process or a precise specification of the required measuring system.

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